

Final

**Site Investigation Report
Boiler Plant No. 4, Building 1876
Parcels 101(7) and 236(7)**

**Fort McClellan
Calhoun County, Alabama**

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Executive Summary

In accordance with Contract Number DACA21-96-D-0018, Task Order CK08, IT Corporation (IT) completed a site investigation (SI) at Boiler Plant No. 4, Building 1876, Parcels 101(7) and 236(7), at Fort McClellan in Calhoun County, Alabama. The SI at Boiler Plant No. 4 was initiated by QST Environmental, Inc. (QST) and was conducted to determine whether chemical constituents are present at the site and, if present, whether the concentrations present an unacceptable risk to human health or the environment. The SI at Boiler Plant No. 4, Building 1876, Parcels 101(7) and 236(7), consisted of the sampling and analysis of four surface soil samples, six subsurface soil samples, and seven groundwater samples by QST. IT collected groundwater samples from five existing wells previously sampled by QST.

Chemical analysis of samples collected at Boiler Plant No. 4, Building 1876, Parcels 101(7) and 236(7), indicates that metals, volatile organic compounds (VOC), and semivolatile organic compounds were detected in the environmental media sampled. To evaluate whether the detected constituents pose an unacceptable risk to human health or the environment, analytical results were compared to the human health site-specific screening levels (SSSL), ecological screening values (ESV), and background screening values for Fort McClellan.

The potential threat to human receptors is expected to be low. Although the site is projected for mixed business reuse, the analytical data were screened against residential human health SSSLs to evaluate the site for unrestricted land reuse. In soils, the metals concentrations that exceeded SSSLs were below their respective background concentration or within the range of background values and do not pose an unacceptable risk to human health. The concentration of the polynuclear aromatic hydrocarbon (PAH) compound benzo(a)pyrene exceeded its SSSL in one surface soil sample but was below its PAH background value. VOC concentrations in soils were below SSSLs.

In groundwater, several metals were detected at concentrations exceeding SSSLs and background concentrations. However, the samples with the elevated metals results had high turbidity at the time of sample collection, which is believed to have caused the elevated concentrations. Evaluation of lower-turbidity groundwater samples indicates that metals have not adversely impacted groundwater at the site. The concentration of chloroform exceeded its SSSL in one groundwater sample. However, the chloroform concentration was below U.S. Environmental Protection Agency drinking water standards and health advisory values and is not expected to pose a threat to human health.

The potential threat to ecological receptors is also expected to be low. With the exception of copper in two surface soil samples, the metals concentrations that exceeded ESVs were below their respective background concentrations or within the range of background values. Three PAH compounds were detected in surface soils at concentrations exceeding ESVs but below PAH background values. VOC concentrations in site media were below ESVs.

Based on the results of the SI, past operations at Boiler Plant No. 4 do not appear to have adversely impacted the environment. The metals and chemical compounds detected in site media do not pose an unacceptable risk to human health or the environment. Furthermore, the two 50,000-gallon underground storage tanks associated with the boiler plant have been removed from the site in accordance with State of Alabama regulations. Therefore, IT recommends “No Further Action” and unrestricted land reuse at Boiler Plant No. 4, Building 1876, Parcels 101(7) and 236(7).

1.0 Introduction

The U.S. Army has selected Fort McClellan (FTMC), located in Calhoun County, Alabama, for closure by the Base Realignment and Closure (BRAC) Commission under Public Laws 100-526 and 101-510. The 1990 Base Closure Act, Public Law 101-510, established the process by which U.S. Department of Defense (DOD) installations would be closed or realigned. The BRAC Environmental Restoration Program requires investigation and cleanup of federal properties prior to transfer to the public domain. The U.S. Army is conducting environmental studies of the impact of suspected contaminants at parcels at FTMC under the management of the U.S. Army Corps of Engineers (USACE)-Mobile District. The USACE contracted IT Corporation (IT) to provide environmental services for completion of the site investigation (SI) at Boiler Plant No. 4, Building 1876, Parcels 101(7) and 236(7), under Contract Number DACA21-96-D-0018, Task Order CK08.

The U.S. Army Environmental Center (AEC) originally contracted QST Environmental, Inc. (QST) to perform the SI at Boiler Plant No. 4, Building 1876, Parcels 101(7) and 236(7). QST prepared an SI work plan (QST, 1998) and conducted field activities in May 1998. Upon further evaluation of the site, the BRAC Cleanup Team (BCT) determined that additional data were needed to characterize the site. Therefore, the USACE contracted IT to collect five additional groundwater samples from existing wells at the site.

This SI report summarizes field activities, including field sampling and analysis and monitoring well installation activities, and data compiled by IT and QST for the SI conducted at Boiler Plant No. 4, Building 1876, Parcels 101(7) and 236(7). The site is hereinafter referred to as Boiler Plant No. 4 and includes all associated parcels unless otherwise specified.

1.1 Project Description

Boiler Plant No. 4 was identified as an area to be investigated prior to property transfer. The site was identified as a Category 7 site in the environmental baseline survey (EBS) (Environmental Science and Engineering, Inc. [ESE], 1998). Category 7 sites are areas that are not evaluated and/or that require further evaluation.

IT prepared a site-specific field sampling plan (SFSP) addendum (IT, 1999a) to QST work plan (QST, 1998) that was finalized in September 1999. The SFSP addendum provided technical guidance for sample collection and analysis at Boiler Plant No 4. The SFSP was used as an attachment to the installation-wide work plan (IT, 1998) and the installation-wide sampling and

analysis plan (SAP) (IT, 2000a). The SAP includes the installation-wide safety and health plan and quality assurance plan.

The SI at Boiler Plant No. 4 consisted of the collection of four surface soil samples (by QST), six subsurface soil samples (QST), and twelve groundwater samples (seven by QST and five by IT) to determine if potential site-specific chemicals are present at the site.

1.2 Purpose and Objectives

The SI program was designed to collect data from site media and provide a level of defensible data and information in sufficient detail to determine whether chemical constituents are present at Boiler Plant No. 4 at concentrations that present an unacceptable risk to human health or the environment. The conclusions of the SI in Chapter 6.0 are based on the comparison of the analytical results to human health site-specific screening levels (SSSL), ecological screening values (ESV), and background screening values for FTMC. The SSSLs and ESVs were developed by IT as part of the human health and ecological risk evaluations associated with SIs being performed under the BRAC Environmental Restoration Program at FTMC. The SSSLs, ESVs, and polynuclear aromatic hydrocarbon (PAH) background screening values are presented in the *Final Human Health and Ecological Screening Values and PAH Background Summary Report* (IT, 2000b). The PAH background screening values were developed by IT at the direction of the BCT to address the occurrence of PAH compounds in surface soils as a result of anthropogenic activities at FTMC. Metals background values are presented in the *Final Background Metals Survey Report, Fort McClellan, Alabama* (Science Applications International Corporation [SAIC], 1998).

Based on the conclusions presented in this SI report, the BCT will decide either to propose “No Further Action” at the site or to conduct additional work at the site.

1.3 Site Description and History

Boiler Plant No. 4, Building 1876 is located on the FTMC Main Post at the intersection of Nielson Street (formerly 8th Avenue) and Heat Street (Figures 1-1 and 1-2). The facility was constructed in 1977 and is currently operated and maintained by Johnson Controls, Inc. (ESE, 1998). Presently, Boiler Plant No. 4 is fired by natural gas; however, the plant has a dual-fired boiler that can also operate using heating oil (Jaye, 2001).

Two 50,000-gallon steel underground storage tanks (UST) were installed at the site in 1975 and were used to store heating oil (ESE, 1998). In 1991, the USTs were upgraded to meet then-current UST requirements. The upgrades included installing interior liners, overfill protection,

and an impressed-current cathodic protection system (Jaye, 2001). The EBS identified an area of stressed vegetation (dead grass) extending downslope and away from a vent pipe located west of the two 50,000-gallon USTs (Figure 1-2). According to the EBS, the vent pipe appeared to be unrelated to the USTs and the cause of the dead grass could not be determined (ESE, 1998).

In August 2000, the USTs were removed by Karst Environmental, Inc. in accordance with Alabama Department of Environmental Management (ADEM) regulations. The ADEM UST Closure Site Assessment Report is included in Appendix A.

A 500-gallon UST is located under a concrete pad on the south side of Building 1876 (Figure 1-2). The original UST at this location was installed in 1975 and was removed and replaced in 1996 (IT, 1999b). The 500-gallon UST is used to store diesel fuel to power a backup generator at the site (IT, 1999b).

2.0 Previous Investigations

An EBS was conducted by ESE to document current environmental conditions of all FTMC property (ESE, 1998). The study was to identify sites that, based on available information, have no history of contamination and comply with DOD guidance for fast-track cleanup at closing installations. The EBS also provides a baseline picture of FTMC properties by identifying and categorizing the properties by seven criteria:

1. Areas where no storage, release, or disposal of hazardous substances or petroleum products has occurred (including no migration of these substances from adjacent areas)
2. Areas where only release or disposal of petroleum products has occurred
3. Areas where release, disposal, and/or migration of hazardous substances has occurred, but at concentrations that do not require a removal or remedial response
4. Areas where release, disposal, and/or migration of hazardous substances has occurred, and all removal or remedial actions to protect human health and the environment have been taken
5. Areas where release, disposal, and/or migration of hazardous substances has occurred, and removal or remedial actions are underway, but all required remedial actions have not yet been taken
6. Areas where release, disposal, and/or migration of hazardous substances has occurred, but required actions have not yet been implemented
7. Areas that are not evaluated or require additional evaluation.

The EBS was conducted in accordance with the Community Environmental Response Facilitation Act (CERFA-Public Law 102-426) protocols and DOD policy regarding contamination assessment. Record searches and reviews were performed on all reasonably available documents from FTMC, ADEM, the U.S. Environmental Protection Agency (EPA) Region IV, and Calhoun County, as well as a database search of Comprehensive Environmental Response, Compensation, and Liability Act-regulated substances, petroleum products, and Resource Conservation and Recovery Act-regulated facilities. Available historic maps and aerial photographs were reviewed to document historic land uses. Personal and telephone interviews of past and present FTMC employees and military personnel were conducted. In addition, visual site inspections were conducted to verify conditions of specific property parcels. Previous UST investigations have been conducted at the site, as described in the following paragraphs.

The 500-gallon UST used to store fuel for a backup generator was removed and replaced in November 1996 (IT, 1999b). According to the closure report prepared by Southern Environmental Management and Specialties, Inc., the depth to groundwater was greater than 5 feet below the bottom of the UST. The closure report also indicated that no notable product odor was found in the excavation and that no holes were observed in the UST (IT, 1999b). Neither soil nor groundwater samples were collected during closure activities.

Two 50,000-gallon USTs used to store heating oil were removed from the site in August 2000 by Karst Environmental, Inc. At the time of closure, the USTs were noted to be in good condition without holes observed in the tanks. The USTs were removed in accordance with ADEM regulations. The ADEM UST Closure Site Assessment Report for the removed USTs is included in Appendix A.

Other investigations to document site environmental conditions have not been conducted at Boiler Plant No. 4. Therefore, the site was classified as a Category 7 CERFA site: areas that are not evaluated or require further evaluation.

3.0 Current Site Investigation Activities

This chapter summarizes SI activities conducted by IT and QST at Boiler Plant No. 4, including environmental sampling and analysis and monitoring well installation activities.

3.1 Environmental Sampling

The environmental sampling performed during the SI at Boiler Plant No. 4 included the collection of surface soil samples, subsurface soil samples, and groundwater samples for chemical analysis. The sample locations, media, and rationale are summarized in Table 3-1. Samples collected by IT are designated with the prefix “GSBP-101”; samples collected by QST are designated with the prefix “SI04.” Samples were submitted for laboratory analysis of site-related parameters listed in Section 3.3.

3.1.1 Surface Soil Sampling

QST collected four surface soil samples at Boiler Plant No. 4. Soil sampling locations and rationale are presented in Table 3-1 and sampling locations are shown on Figure 3-1. Sample designations and quality assurance/quality control (QA/QC) samples are listed in Table 3-2.

Sample Collection. Surface soil samples were collected from 0 to 1 foot below ground surface (bgs) using a direct-push sampling system as described in the QST work plan (QST, 1998). The samples were analyzed for parameters listed in Table 3-2 using methods outlined in Section 3.3. Sample collection logs are included in Appendix B.

3.1.2 Subsurface Soil Sampling

QST collected six subsurface soil samples from three soil borings. Two subsurface soil samples were collected from each boring. The subsurface soil sample locations are shown on Figure 3-1, and the sampling locations and rationale are presented in Table 3-1. Subsurface soil sample designations, depths, and QA/QC samples are listed in Table 3-2. Sample collection logs are included in Appendix B.

Sample Collection. QST contracted Graves Service Company, Inc. to complete the soil borings. Subsurface soil samples were collected from the soil borings at depths greater than 6 feet bgs using a direct-push sampling system following procedures outlined in the QST work plan (QST, 1998).

Table 3-1

**Sampling Locations and Rationale
Boiler Plant No. 4, Building 1876, Parcels 101(7) and 236(7)
Fort McClellan, Calhoun County, Alabama**

Sample Location	Sample Media	Sample Location Rationale
GSBP-101-MW01	Groundwater	A groundwater sample was collected from an existing monitoring well to determine the presence of petroleum constituents in groundwater.
GSBP-101-MW02	Groundwater	A groundwater sample was collected from an existing monitoring well to determine the presence of petroleum constituents in groundwater.
GSBP-101-MW03	Groundwater	A groundwater sample was collected from an existing compliance monitoring well to determine the presence of petroleum constituents in groundwater.
GSBP-101-MW04	Groundwater	A groundwater sample was collected from an existing compliance monitoring well to determine the presence of petroleum constituents in groundwater.
GSBP-101-MW05	Groundwater	A groundwater sample was collected from an existing compliance monitoring well to determine the presence of petroleum constituents in groundwater.
SI04-SS06 SI04-SS02 SI04-GWS01	Surface Soil Subsurface Soil Groundwater	Surface soil, subsurface soil, and groundwater samples were collected west of the UST location to determine the presence of petroleum constituents in soils and groundwater. The surface soil sample was collected to assess the cause of stressed vegetation in the area.
SI04-SS07 SI04-GWS02	Surface Soil Groundwater	Surface soil and groundwater samples were collected adjacent to Building 1876 to determine the presence of petroleum constituents in soils and groundwater. The surface soil sample was collected to assess the cause of stressed vegetation in the area.
SI04-GW01	Groundwater	A groundwater sample was collected from an existing compliance monitoring well to determine the presence of petroleum constituents in groundwater.
SI04-GW02	Groundwater	A groundwater sample was collected from an existing compliance monitoring well to determine the presence of petroleum constituents in groundwater.
SI04-GW03	Groundwater	A groundwater sample was collected from an existing compliance monitoring well to determine the presence of petroleum constituents in groundwater.
SI04-GW04	Groundwater	A groundwater sample was collected from an existing compliance monitoring well to determine the presence of petroleum constituents in groundwater.
SI04-GW05	Groundwater	A groundwater sample was collected from an existing compliance monitoring well to determine the presence of petroleum constituents in groundwater.
SI04-SS01	Subsurface Soil	Two subsurface soil samples were collected from a soil boring installed north of the UST location to determine the presence of petroleum constituents in soil.
SI04-SS03	Subsurface Soil	Two subsurface soil samples were collected from a soil boring installed near the northeast corner of Building 1876 to determine the presence of petroleum constituents in soil.
SI04-SS04	Surface Soil	A surface soil sample was collected adjacent to the UST location to determine the presence of petroleum constituents in soil.
SI04-SS05	Surface Soil	A surface soil sample was collected adjacent to the UST location to determine the presence of petroleum constituents in soil.

Table 3-2

**Soil Sample Designations and QA/QC Samples
Boiler Plant No. 4, Building 1876, Parcels 101(7) and 236(7)
Fort McClellan, Calhoun County, Alabama**

Sample Location	Sample Designation	Sample Depth (ft bgs)	QA/QC Samples			Analytical Suite
			Field Duplicates	Field Splits	MS/MSD	
SI04-GWS01	04-SS06	0-1				VOCs, SVOCs, Metals, TOC
	04-SS02A	10-11				
	04-SS02B	11-12	04-SS02B-FD			
SI04-GWS02	04-SS07	0-1				VOCs, SVOCs, Metals
SI04-SS01	04-SS01A	11-12				VOCs, SVOCs, Metals, TOC
	04-SS01B	12-13				
SI04-SS03	04-SS03A	6-7				VOCs, SVOCs, Metals
	04-SS03B	7-8				
SI04-SS04	04-SS04	0-1				VOCs, SVOCs, Metals
SI04-SS05	04-SS05	0-1				VOCs, SVOCs, Metals

FD - Field duplicate.

ft bgs - Feet below ground surface

MS/MSD - Matrix spike/matrix spike duplicate.

QA/QC - Quality assurance/quality control.

SVOC - Semivolatile organic compound.

TOC - Total organic carbon.

VOC - Volatile organic compound.

3.1.3 Well Installation

QST installed two temporary monitoring wells in the saturated zone at Boiler Plant No. 4 using a direct-push sampling system. The well locations are shown on Figure 3-1. Table 3-3 summarizes construction details of the temporary monitoring wells installed by QST at Boiler Plant No. 4. The well construction logs are included in Appendix C.

QST contracted Graves Service Company, Inc. to install the temporary wells using direct-push technology at the locations shown on Figure 3-1. The temporary wells were installed, purged and sampled, and removed within 24 hours. Well development was not indicated on the QST boring logs, sampling forms, or field notes. Initially, a 2-inch diameter borehole for each temporary well was installed 5 feet into the uppermost water-bearing zone (QST, 1998). Soil descriptions were prepared by the QST geologist and are presented in Appendix C of this report. Upon reaching the target depth at each borehole, a 10-foot-length of 1-inch (nominal) diameter polyvinyl chloride (PVC) slotted screen (0.010-inch) was attached to a 1-inch (nominal) diameter PVC riser and lowered into the borehole. A sand pack consisting of silica sand (sieve size 20 to 40) was placed into the annular space to ground surface or to approximately 5 feet above the top of the screen.

3.1.4 Water Level Measurements

The depth to groundwater was measured by IT in permanent monitoring wells at Boiler Plant No. 4 on March 13, 2000, following procedures outlined in Section 4.18 of the SAP (IT, 2000a). Depth to groundwater was measured with an electronic water level meter. The meter probe and cable were cleaned between use at each well following decontamination methodology presented in Section 4.10 of the SAP (IT, 2000a). Measurements were referenced to the top of the well casing. A summary of groundwater level measurements is presented in Table 3-4.

3.1.5 Groundwater Sampling

A total of 12 groundwater samples were collected at Boiler Plant No. 4. QST collected groundwater samples from the two temporary monitoring wells installed during the SI and from five existing compliance monitoring wells. IT collected groundwater samples from the five existing monitoring wells previously sampled by QST. The groundwater sampling locations and rationale are listed in Table 3-1. The groundwater sample designations and QA/QC samples are listed in Table 3-5.

IT Sample Collection. Groundwater samples were collected after purging a minimum of three well volumes and after field parameters (temperature, pH, dissolved oxygen, specific conductivity, oxidation-reduction potential, and turbidity) stabilized. Purging and sampling were

Table 3-3

**Temporary Well Construction Summary
Boiler Plant No. 4, Building 1876, Parcels 101(7) and 236(7)
Fort McClellan, Calhoun County, Alabama**

Well Location	Northing	Easting	Well Depth (ft bgs)	Screen Length (ft)	Screen Interval (ft bgs)	Well Material
SI04-GWS01	1167873.25	671568.51	12	10	2 - 12	1" ID Sch. 40 PVC
SI04-GWS02	1167845.76	671558.73	17	10	6.5 - 16.5	1" ID Sch. 40 PVC

Temporary wells were installed by QST using direct-push technology.

Horizontal coordinates referenced to the U.S. State Plane Coordinate System, Alabama East Zone, North American Datum of 1983 (NAD83).

Well locations were not surveyed for elevation.

1" ID Sch. 40 PVC - 1-inch inside diameter, Schedule 40, polyvinyl chloride.

bgs - Below ground surface.

ft - Feet.

msl - Mean sea level.

Table 3-4

**Groundwater Elevations
Boiler Plant No. 4, Building 1876, Parcels 101(7) and 236(7)
Fort McClellan, Calhoun County, Alabama**

Well Location	Date	Depth to Water (ft btoc)	Top of Casing Elevation (ft msl)	Ground Elevation (ft msl)	Groundwater Elevation (ft msl)
GSBP-101-MW01	13-Mar-00	2.11	799.65	800.04	797.53
GSBP-101-MW02	13-Mar-00	2.14	800.45	800.83	798.30
GSBP-101-MW03	13-Mar-00	2.98	801.32	801.93	798.34
GSBP-101-MW04	13-Mar-00	4.34	802.76	803.39	798.42
GSBP-101-MW05	13-Mar-00	1.63	800.03	800.63	798.39

Elevations referenced to the North American Vertical Datum of 1988.

btoc - Below top of casing.

ft - Feet.

msl - Mean sea level.

Table 3-5

**Groundwater Sample Designations and QA/QC Samples
Boiler Plant No. 4, Building 1876, Parcels 101(7) and 236(7)
Fort McClellan, Calhoun County, Alabama**

Sample Location	Sample Designation	QA/QC Samples			Analytical Suite
		Field Duplicates	Field Splits	MS/MSD	
SI04-GWS01	04-GWS01				VOCs, SVOCs, TAL Metals
SI04-GWS02	04-GWS02				VOCs, SVOCs, TAL Metals
SI04-GW01	04-GW01				VOCs, SVOCs, TAL Metals
SI04-GW02	04-GW02				VOCs, SVOCs, TAL Metals
SI04-GW03	04-GW03				VOCs, SVOCs, TAL Metals
SI04-GW04	04-GW04				VOCs, SVOCs, TAL Metals
SI04-GW05	04-GW05				VOCs, SVOCs, TAL Metals
GSBP-101-MW01	GSBP-101-MW01-GW-BA3001-REG	GSBP-101-MW01-GW-BA3002-FD	GSBP-101-MW01-GW-BA3003-FS		TAL Metals
GSBP-101-MW02	GSBP-101-MW02-GW-BA3004-REG			GSBP-101-MW02-GW-BA3004-MS GSBP-101-MW02-GW-BA3004-MSD	TCL VOCs, TCL SVOCs, TAL Metals
GSBP-101-MW03	GSBP-101-MW03-GW-BA3005-REG				TAL Metals
GSBP-101-MW04	GSBP-101-MW04-GW-BA3006-REG				TAL Metals
GSBP-101-MW05	GSBP-101-MW05-GW-BA3007-REG				TAL Metals

Groundwater samples were collected from the approximate midpoint of the saturated screened interval of the monitoring well.

FD - Field duplicate.

FS - Field split.

MS/MSD - Matrix spike/matrix spike duplicate.

REG - Field sample.

QA/QC - Quality assurance/quality control.

TAL - Target analyte list.

TCL - Target compound list.

VOC - Volatile organic compound.

SVOC - Semivolatile organic compound.

performed with either a peristaltic or submersible pump equipped with Teflon™ tubing. Field parameters were measured using a calibrated water quality meter. Field parameter readings are summarized in Table 3-6. Sample collection logs are included in Appendix B. The samples were analyzed for the parameters listed in Table 3-5 using methods outlined in Section 3.3.

QST Sample Collection. Purging and sampling were performed with a centrifugal pump on the existing wells, and with a peristaltic pump on the direct-push technology (DPT) wells. Groundwater samples were collected immediately following completion of well purging. Groundwater sample parameters were recorded for pH, conductivity, and temperature (turbidity, dissolved oxygen, and oxidation-reduction potential were not monitored). Field parameter readings are summarized in Table 3-6. Sample collection logs are included in Appendix B. The samples were analyzed for the parameters listed in Table 3-5 using methods outlined in Section 3.3.

3.2 Surveying of Sample Locations

IT surveyed sample locations using global positioning system survey techniques described in Section 4.3 of the SAP (IT, 2000a) and conventional civil survey techniques described in Section 4.19 of the SAP (IT, 2000a). Horizontal coordinates were referenced to the U.S. State Plane Coordinate System, Alabama East Zone, North American Datum of 1983. Elevations were referenced to the North American Vertical Datum of 1988. Horizontal coordinates and elevations are included in Appendix D.

QST surveyed sample locations using global positioning system survey techniques or traditional surveying techniques described in the QST work plan (QST, 1998). Map coordinates for each sample location were determined using a Transverse Mercator (UTM) or State Planar grid to within ±3 feet (±1 meter). Horizontal coordinates are included in Appendix D.

3.3 Analytical Program

Samples collected by IT and QST during the SI were analyzed for various chemical parameters. The specific suite of analyses performed was based on the potential site-specific chemicals historically at the site and on EPA, ADEM, FTMC, and USACE requirements. Target analyses for samples collected at Boiler Plant No. 4 included the following parameters:

- VOC – EPA Method 8260B
- Semivolatile organic compounds (SVOC) – EPA Method 8270C
- Target analyte list metals – EPA Method 6010B/7000
- Total organic carbon (TOC) – EPA Method 9060 (two subsurface soil samples only).

Table 3-6

**Groundwater Field Parameters
Boiler Plant No. 4, Building 1876, Parcels 101(7) and 236(7)
Fort McClellan, Calhoun County, Alabama**

Sample Location	Sample Date	Specific Conductivity (mS/cm)^a	Dissolved Oxygen (mg/L)	ORP (mV)	Temperature (°C)	Turbidity (NTU)	pH (SU)
SI04-GW01	21-May-98	0.170	NR	NR	20.5	229	6.5
SI04-GW02	21-May-98	0.230	NR	NR	20.6	182	7.0
SI04-GW03	21-May-98	0.140	NR	NR	20.5	292	6.7
SI04-GW04	26-May-98	0.200	NR	NR	15.2	NR ^b	6.5
SI04-GW05	26-May-98	0.270	NR	NR	18.0	NR ^b	6.9
SI04-GWS01	8-May-98	0.280	NR	NR	19.4	NR	6.7
SI04-GWS02	8-May-98	0.155	NR	NR	21.3	NR	6.9
GSBP-101-MW01	17-Dec-99	0.570	1.7	50	18.3	16.7	7.0
GSBP-101-MW02	16-Dec-99	0.587	4.7	210	16.1	158.0	7.3
GSBP-101-MW03	16-Dec-99	0.391	1.2	-35	17.8	52.3	6.9
GSBP-101-MW04	16-Dec-99	0.563	1.3	15	18.5	7.2	6.4
GSBP-101-MW05	17-Dec-99	0.451	0.5	-60	19.1	56.1	7.1

^aSpecific conductivity values standardized to millisiemens per centimeter.

^bSample collection log indicates "very cloudy" purge water.

°C - Degrees Celsius.

mS/cm - Millisiemens per centimeter.

mV - Millivolts.

NR - Not recorded.

NTU - Nephelometric turbidity units.

ORP - Oxidation-reduction potential.

SU - Standard units.

The samples were analyzed using EPA SW-846 methods, including Update III methods where applicable.

3.4 Sample Preservation, Packaging, and Shipping

IT sample preservation, packaging, and shipping followed requirements specified in Section 4.13.2 of the SAP (IT, 2000a). Sample containers, sample volumes, preservatives, and holding times for the analyses required in this SI are listed in Chapter 5.0, Table 5-1, of Appendix B of the SAP (IT, 2000a). Sample documentation and chain-of-custody records were completed as specified in Section 4.13 of the SAP (IT, 2000a). Completed analysis request and chain-of-custody records (Appendix B) were secured and included with each shipment of sample coolers to Quanterra Environmental Services in Knoxville, Tennessee. Split samples were shipped to the USACE South Atlantic Division Laboratory in Marietta, Georgia.

QST sample preservation, packaging, and shipping followed guidelines specified in the QST work plan (QST, 1998).

3.5 Investigation-Derived Waste Management and Disposal

IT Investigation-Derived Waste. IT investigation-derived waste (IDW) was managed and disposed as outlined in Appendix D of the SAP (IT, 2000a). The IDW generated during the SI at Boiler Plant No. 4 was segregated as follows:

- Purge water from well development and sampling activities and decontamination fluids
- Personal protective equipment.

Solid IDW was stored inside the fenced area surrounding Buildings 335 and 336 in lined roll-off bins prior to characterization and final disposal. Solid IDW was characterized using toxicity characteristic leaching procedures (TCLP) analyses. Based on the results, personal protective equipment generated during the SI at Boiler Plant No. 4 was disposed as nonregulated waste at the Industrial Waste Landfill on the Main Post of FTMC.

Liquid IDW was contained in the existing 20,000-gallon sump associated with the Building T-338 vehicle washrack. Liquid IDW was characterized by VOC, SVOC, and metals analyses. Based on the analyses, liquid IDW was discharged as nonregulated waste to the FTMC wastewater treatment plant on the Main Post.

QST Investigation-Derived Waste. QST-generated IDW was managed and disposed as outlined in the QST work plan (QST, 1998).

3.6 Variances/Nonconformances

Neither IT nor QST recorded any variances or nonconformances during completion of the SI at Boiler Plant No. 4.

3.7 Data Quality

IT Data. The field sample analytical data are presented in tabular form in Appendix E. Samples collected by IT were documented, handled, analyzed, and reported in a manner consistent with the SI work plan, the FTMC SAP and quality assurance plan, and standard, accepted methods and procedures. Sample collection logs pertaining to the collection of these samples were reviewed and organized for this report and are included in Appendix B.

Data were reported and evaluated in accordance with USACE South Atlantic Savannah Level B criteria (USACE, 1994) and the stipulated requirements for the generation of definitive data (Section 3.1.2 of Appendix B of the SAP [IT, 2000a]). Chemical data were reported via hard copy data packages by the laboratory using Contract Laboratory Program-like forms. A summary of validated data is included in Appendix E. A complete (100 percent) Level III data validation effort was performed on the reported analytical data. A data validation summary report that discusses the results of the validation is included in Appendix F. Selected results were rejected or otherwise qualified based on the implementation of accepted data validation procedures and practices during the validation effort. These qualified parameters are highlighted in the report. The validation-assigned qualifiers were added to the FTMC ITEMS database for tracking and reporting. The qualified data were used in the comparison to the SSSLs and ESVs developed by IT. Rejected data (assigned an “R” data qualifier) were not used in the comparison to the SSSLs and ESVs. The IT data presented in this report, except where qualified, meet the principle data quality objective for this SI.

QST Data. QST data were submitted to the IRDMIS database at the conclusion of SI field activities. Hard-copy data packages were sent to the AEC in Edgewood, Maryland for storage. IT retrieved the electronic data via IRDMIS and the original data packages from the AEC for evaluation. From the IRDMIS data, IT was able to identify the key fields of information (analytical records, well construction and geotechnical information, sample location information, and water level readings) and translate the data into the ITEMS database.

QST hard copy analytical data packages were validated during a complete (i.e., 100 percent) Level III data validation effort. A data validation summary report that discusses the QST data validation is included in Appendix F. Selected results were rejected or qualified based on the implementation of accepted data validation procedures and practices. These qualified parameters are highlighted in the data validation report. In addition, during the validation the electronic results were compared to the hard copy results. Concentrations in the database were corrected where necessary and validation qualifiers added to the QST data using ITEMS to reflect the findings summarized in the QST data validation report.

After the QST data validation was completed and the results were updated, the QST data and the IT data were merged using ITEMS for inclusion in this SI report. The combined validated analytical data are presented in tabular form in Appendix E. The validated data were used in the comparison to the SSSLs and ESVs developed by IT in Chapter 5.0. Rejected data (assigned an "R" data qualifier) were not used in the comparison to SSSLs and ESVs. The QST analytical data presented in this report, except where qualified, meet the principle data quality objective for this SI.

4.0 Site Characterization

Subsurface investigations performed at Boiler Plant No. 4 provided soil, bedrock, and groundwater data used to characterize the geology and hydrogeology of the site.

4.1 Regional and Site Geology

4.1.1 Regional Geology

Calhoun County includes parts of two physiographic provinces, the Piedmont Upland Province and the Valley and Ridge Province. The Piedmont Upland Province occupies the extreme eastern and southeastern portions of the county and is characterized by metamorphosed sedimentary rocks. The generally accepted range in age of these metamorphics is Cambrian to Devonian.

The majority of Calhoun County, including the Main Post of FTMC, lies within the Appalachian fold and thrust structural belt (Valley and Ridge Province) where southeastward-dipping thrust faults with associated minor folding are the predominant structural features. The fold-and-thrust belt consists of Paleozoic sedimentary rocks that have been asymmetrically folded and thrust-faulted with major structures and faults striking in a northeast-southwest direction.

Northwestward transport of the Paleozoic rock sequence along the thrust faults has resulted in the imbricate stacking of large slabs of rock referred to as thrust sheets. Within an individual thrust sheet, smaller faults may splay off the larger thrust fault, resulting in imbricate stacking of rock units within an individual thrust sheet (Osborne and Szabo, 1984). Geologic contacts in this region generally strike parallel to the faults and repetition of lithologic units is common in vertical sequences. Geologic formations within the Valley and Ridge Province portion of Calhoun County have been mapped by Warman and Causey (1962), Osborne and Szabo (1984), and Moser and DeJarnette (1992), and vary in age from Lower Cambrian to Pennsylvanian.

The basal unit of the sedimentary sequence in Calhoun County is the Cambrian Chilhowee Group. The Chilhowee Group is comprised of the Cochran, Nichols, Wilson Ridge, and Weisner Formations (Osborne and Szabo, 1984), but in Calhoun County is either undifferentiated or divided into the Cochran and Nichols Formations and an upper undifferentiated Wilson Ridge and Weisner Formation. The Cochran is composed of poorly sorted arkosic sandstone and conglomerate with interbeds of greenish-gray siltstone and mudstone. Massive to laminated, greenish-gray and black mudstone makes up the Nichols Formation with thin interbeds of

siltstone and very fine-grained sandstone (Szabo et al., 1988). These two formations are mapped only in the eastern part of the county.

The Wilson Ridge and Weisner Formations are undifferentiated in Calhoun County and consist of both coarse-grained and fine-grained clastics. The coarse-grained facies appear to dominate the unit and consist primarily of coarse-grained, vitreous quartzite and friable, fine- to coarse-grained, orthoquartzitic sandstone, both of which locally contain conglomerate. The fine-grained facies consist of sandy and micaceous shale and silty, micaceous mudstone, which are locally interbedded with the coarse clastic rocks. The abundance of orthoquartzitic sandstone and quartzite suggests that most of the Chilhowee Group bedrock in the vicinity of FTMC belongs to the Weisner Formation (Osborne and Szabo, 1984).

The Cambrian Shady Dolomite overlies the Weisner Formation northeast, east, and southwest of the Main Post and consists of interlayered bluish-gray or pale yellowish-gray sandy dolomitic limestone and siliceous dolomite with coarsely crystalline porous chert (Osborne et al., 1989). A variegated shale and clayey silt have been included within the lower part of the Shady Dolomite (Cloud, 1966). Material similar to this lower shale unit was noted in core holes drilled by the Alabama Geologic Survey on FTMC (Osborne and Szabo, 1984). The character of the Shady Dolomite in the FTMC vicinity and the true assignment of the shale at this stratigraphic interval are still uncertain (Osborne, 1999).

The Rome Formation overlies the Shady Dolomite and locally occurs to the northwest and southeast of the Main Post as mapped by Warman and Causey (1962) and Osborne and Szabo (1984) and immediately to the west of Reilly Airfield (Osborne and Szabo, 1984). The Rome Formation consists of variegated, thinly interbedded grayish-red-purple mudstone, shale, siltstone, and greenish-red and light gray sandstone, with locally occurring limestone and dolomite. The Conasauga Formation overlies the Rome Formation and occurs along anticlinal axes in the northeastern portion of Pelham Range (Warman and Causey, 1962) (Osborne and Szabo, 1984) and the northern portion of the Main Post (Osborne et al., 1997). The Conasauga Formation is composed of dark-gray, finely to coarsely crystalline, medium- to thick-bedded dolomite with minor shale and chert (Osborne et al., 1989).

Overlying the Conasauga Formation is the Knox Group, which is composed of the Copper Ridge and Chepultepec dolomites of Cambro-Ordovician age. The Knox Group is undifferentiated in Calhoun County and consists of light medium gray, fine to medium crystalline, variably bedded to laminated, siliceous dolomite and dolomitic limestone that weathers to a chert residuum

(Osborne and Szabo, 1984). The Knox Group underlies a large portion of the Pelham Range area.

The Ordovician Newala and Little Oak Limestones overlie the Knox Group. The Newala Limestone consists of light to dark gray, micritic, thick-bedded limestone with minor dolomite. The Little Oak Limestone is composed of dark gray, medium- to thick-bedded, fossiliferous, argillaceous to silty limestone with chert nodules. These limestone units are mapped together as undifferentiated at FTMC and other parts of Calhoun County. The Athens Shale overlies the Ordovician limestone units. The Athens Shale consists of dark-gray to black shale and graptolitic shale with localized interbedded dark gray limestone (Osborne et al., 1989). These units occur within an eroded "window" in the uppermost structural thrust sheet at FTMC and underlie much of the developed area of the Main Post.

Other Ordovician-aged bedrock units mapped in Calhoun County include the Greensport Formation, Colvin Mountain Sandstone, and Sequatchie Formation. These units consist of various siltstones, sandstones, shales, dolomites, and limestones and are mapped as one, undifferentiated unit in some areas of Calhoun County. The only Silurian-age sedimentary formation mapped in Calhoun County is the Red Mountain Formation. This unit consists of interbedded red sandstone, siltstone, and shale with greenish-gray to red silty and sandy limestone.

The Devonian Frog Mountain Sandstone consists of sandstone and quartzitic sandstone with shale interbeds, dolomudstone, and glauconitic limestone (Szabo et al., 1988). This unit locally occurs in the western portion of Pelham Range.

The Mississippian Fort Payne Chert and the Maury Formation overlie the Frog Mountain Sandstone and are composed of dark- to light-gray limestone with abundant chert nodules and greenish-gray to grayish-red phosphatic shale with increasing amounts of calcareous chert toward the upper portion of the formation (Osborne and Szabo, 1984). These units occur in the northwestern portion of Pelham Range. Overlying the Fort Payne Chert is the Floyd Shale, also of Mississippian age, which consists of thin-bedded, fissile brown to black shale with thin intercalated limestone layers and interbedded sandstone. Osborne and Szabo (1984) reassigned the Floyd Shale, which was mapped by Warman and Causey (1962) on the Main Post of FTMC, to the Ordovician Athens Shale on the basis of fossil data.

The Jacksonville Thrust Fault is the most significant structural geologic feature in the vicinity of FTMC, both for its role in determining the stratigraphic relationships in the area and for its

contribution to regional water supplies. The trace of the fault extends northeastward for approximately 39 miles between Bynum, Alabama and Piedmont, Alabama. The fault is interpreted as a major splay of the Pell City Fault (Osborne and Szabo, 1984). The Ordovician sequence comprising the Eden thrust sheet is exposed at FTMC through an eroded "window" or "fenster" in the overlying thrust sheet. Rocks within the window display complex folding with the folds being overturned and tight to isoclinal. The carbonates and shales locally exhibit well-developed cleavage (Osborne and Szabo, 1984). The FTMC window is framed on the northwest by the Rome Formation; on the north by the Conasauga Formation; on the northeast, east, and southwest by the Shady Dolomite; and on the southeast and southwest by the Chilhowee Group (Osborne et al., 1997).

4.1.2 Site Geology

The soil mapped at Boiler Plant No. 4 is the Anniston and Allen gravelly clay loam. The Anniston and Allen gravelly clay loam is typically reddish-brown and is derived from shale or limestone bedrock. This soil has a slow infiltration and poor moisture capacity, which makes this soil very susceptible to erosion (U.S. Department of Agriculture, 1961).

The bedrock at the site is mapped as the undifferentiated Mississippian/Ordovician Floyd and Athens Shale (Osborne et al., 1997). The Floyd and Athens Shale consists of brown, dark-gray to black shale with localized interbedded limestone and sandstone (Osborne et al., 1989).

Based on boring logs completed by QST, the soil encountered during direct-push activities at Boiler Plant No. 4 consisted of light brown to reddish-brown clay to clayey silt. Dark gray to black shale was encountered during the installation of temporary monitoring wells SI04-GWS01 and SI04-GWS02 at a depth of approximately 11 feet bgs.

4.2 Site Hydrology

4.2.1 Surface Hydrology

Precipitation in the form of rainfall averages about 54 inches annually in Anniston, Alabama, with infiltration rates annually exceeding evapotranspiration rates (U.S. Department of Commerce, National Oceanic and Atmospheric Administration, 1998). The major surface water features at the Main Post of FTMC include Remount Creek, Cane Creek, and Cave Creek. These waterways flow in a general northwest to westerly direction towards the Coosa River on the western boundary of Calhoun County.

Site elevation at Boiler Plant No. 4 is approximately 800 feet above mean sea level. The land surface at the site gently slopes to the northwest. Surface drainage at the site follows topography and generally flows to the northwest. Surface runoff collects in storm sewers and man-made surface drainage features located north of the site. The storm sewers and man-made surface drainage features eventually empty into Cane Creek.

4.2.2 Hydrogeology

Static groundwater levels were measured in five existing monitoring wells at Boiler Plant No. 4 on March 13, 2000 (Table 3-4). Groundwater elevations were calculated by measuring the depth to groundwater relative to the top-of-casing elevations. Figure 4-1 is a groundwater elevation contour map constructed from the March 2000 data.

Groundwater in the area of Boiler Plant No. 4 has a general flow direction to the northwest as shown on Figure 4-1. The average hydraulic gradient in the area of Boiler Plant No. 4 is approximately 0.01 feet per foot.

5.0 Summary of Analytical Results

The results of the chemical analysis of samples collected at Boiler Plant No. 4 indicate that metals, VOCs, and SVOCs were detected in the various site media. To evaluate whether the detected constituents present an unacceptable risk to human health and the environment, analytical results were compared to the human health SSSLs and ESVs for FTMC. The SSSLs and ESVs were developed by IT for human health and ecological risk evaluations as part of the ongoing SIs being performed under the BRAC Environmental Restoration Program at FTMC.

Metals concentrations exceeding the SSSLs and ESVs were subsequently compared to metals background screening values (background concentrations) (SAIC, 1998) to determine if the metals concentrations are within natural background concentrations. Summary statistics for background metals samples collected at FTMC (SAIC, 1998) are included in Appendix G. Additionally, PAH compound concentrations in surface soils that exceeded the SSSLs and ESVs were compared to PAH background screening values. The PAH background screening values were derived from PAH analytical data from 18 parcels at FTMC that were determined to represent anthropogenic activity (IT, 2000b). PAH background screening values were developed for two categories of surface soils: beneath asphalt and adjacent to asphalt. The PAH background screening values for soils adjacent to asphalt are the more conservative (i.e., lower) of the PAH background values and are the values used herein for comparison.

Six compounds were quantified by both SW-846 Method 8260B (as VOC) and Method 8270C (as SVOC), including 1,2,4-trichlorobenzene, 1,4-dichlorobenzene, 1,3-dichlorobenzene, 1,2-dichlorobenzene, hexachlorobutadiene, and naphthalene. Method 8260B yields a reporting limit (RL) of 0.005 milligram per kilogram (mg/kg), while Method 8270C has a RL of 0.330 mg/kg, which is typical for a soil matrix sample. Because of the direct nature of the Method 8260B analysis and its resulting lower RL, this method should be considered superior to Method 8270C when quantifying low levels (0.005 to 0.330 mg/kg) of these compounds. Method 8270C and its associated methylene chloride extraction step is superior, however, when dealing with samples that contain higher concentrations (greater than 0.330 mg/kg) of these compounds; therefore, all data were considered and none were categorically excluded. Data validation qualifiers were helpful in evaluating the usability of data, especially if calibration, blank contamination, precision, or accuracy indicator anomalies were encountered. The validation qualifiers and concentrations reported (e.g., whether concentrations were less than or greater than 0.330 mg/kg) were used to determine which analytical method was likely to return the more accurate result.

The following sections and Tables 5-1 through 5-3 summarize the results of the comparison of detected constituents to the SSSLs, ESVs, and background screening values. Complete analytical results are presented in Appendix E.

5.1 Surface Soil Analytical Results

Four surface soil samples were collected by QST for chemical analysis at Boiler Plant No. 4. Surface soil samples were collected from the upper 1 foot of soil at the locations shown on Figure 3-1. Analytical results were compared to residential human health SSSLs, ESVs, and background screening values (metals and PAHs), as presented in Table 5-1.

Metals. Twenty-three metals were detected in surface soil samples collected at Boiler Plant No. 4. The concentrations of five metals (aluminum, arsenic, chromium, iron, and manganese) exceeded SSSLs. With the exception of iron in one sample (SI04-SS05), the concentrations of these metals were below their respective background concentration. The iron concentration (37,000 mg/kg) at SI04-SS05 was within the range of background iron values (2,510 to 56,300 mg/kg) determined by SAIC (1998) (Appendix G).

Nine metals (aluminum, chromium, copper, iron, lead, manganese, mercury, vanadium, and zinc) in the surface soil sampled at the site exceeded ESVs. Of these metals, the concentrations of copper (in two samples), iron (one sample), lead (one sample), mercury (one sample), and zinc (three samples) also exceeded their respective background concentrations. With the exception of the copper results, the concentrations of these metals were within the range of background values determined by SAIC (1998) (Appendix G).

Volatile Organic Compounds. Ten VOCs (2-butanone, 4-methyl-2-pentanone, acetone, benzene, carbon disulfide, ethylbenzene, methylene chloride, tetrachloroethene, toluene, and xylenes) were detected in surface soil samples collected at the site. VOC concentrations in the surface soil samples ranged from 0.00054 to 0.12 mg/kg, and the cumulative concentration was 0.445 mg/kg.

The VOC concentrations in surface soils were below SSSLs and ESVs.

Semivolatile Organic Compounds. Twelve SVOCs, including eleven PAH compounds, were detected in surface soil samples collected at Boiler Plant No. 4. Each of the detected SVOCs was present in the sample collected at SI04-GWS01. SVOC concentrations in the surface soil samples ranged from 0.02 to 0.55 mg/kg, and the cumulative concentration was 2.52 mg/kg.

The concentration of one PAH compound (benzo[a]pyrene) exceeded its SSSL at one sample location (SI04-GWS01) but was below the PAH background value. The concentrations of three PAHs (benzo[a]pyrene, fluoranthene, and pyrene) exceeded ESVs but were below PAH background values.

5.2 Subsurface Soil Analytical Results

Six subsurface soil samples were collected by QST for chemical analysis at Boiler Plant No. 4. Subsurface soil samples were collected at depths greater than 6 feet bgs at the locations shown on Figure 3-1. Analytical results were compared to residential human health SSSLs and metals background screening values, as presented in Table 5-2.

Metals. Twenty-two metals were detected in subsurface soil samples collected at Boiler Plant No. 4. The thallium results were flagged with a “B” data qualifier, indicating that thallium was also detected in an associated laboratory or field blank sample.

The concentrations of four metals (aluminum, arsenic, chromium, and iron) exceeded SSSLs but were below their respective background concentrations.

Volatile Organic Compounds. Twelve VOCs were detected in subsurface soil samples collected at Boiler Plant No. 4. VOC concentrations in the subsurface soil samples ranged from 0.00053 to 0.052 mg/kg, and the cumulative concentration was 0.382 mg/kg.

The VOC concentrations in subsurface soils were below SSSLs.

Semivolatile Organic Compounds. Bis(2-ethylhexyl)phthalate was detected in each of the subsurface soil samples collected at Boiler Plant No. 4. The analytical results were flagged with a “B” data qualifier, indicating that the compound was also detected in an associated laboratory or field blank sample.

The bis(2-ethylhexyl)phthalate concentrations were below the SSSL.

Total Organic Carbon. Two of the subsurface soil samples (sample numbers 04-SS01B and 04-SS02B) were analyzed for TOC content. TOC concentrations in the samples were 3,650 mg/kg and 1,930 mg/kg, as summarized in Appendix E.

5.3 Groundwater Analytical Results

A total of 12 groundwater samples were collected for chemical analysis at Boiler Plant No. 4. The well/groundwater sampling locations are shown on Figure 3-1. QST collected samples from two temporary monitoring wells installed during the SI and from five existing wells at the site. IT collected groundwater samples from the five existing wells previously sampled by QST. The analytical results were compared to residential human health SSSLs and metals background screening values, as presented in Table 5-3.

Metals. Twenty-two metals were detected in groundwater samples collected at Boiler Plant No. 4. Several metals were detected at concentrations exceeding SSSLs and background concentrations. However, the majority of these metals were present in seven groundwater samples that had high turbidity at the time of sample collection. To evaluate the effects of turbidity on metals concentrations in groundwater at FTMC, IT resampled five wells that previously had high turbidity using a “low flow” purging and sampling technique to reduce turbidity to below 10 nephelometric turbidity units (NTU). The resampling study demonstrated that the concentrations of most metals were significantly lower than in the higher turbidity samples (IT, 2000c) (Appendix H). Consequently, the elevated metals results in the seven samples are most likely the result of high turbidity.

Evaluation of four wells (GSBP-101-MW01, GSBP-101-MW03, GSBP-101-MW04, and GSBP-101-MW05) at Boiler Plant No. 4 that had relatively low sample turbidity (approximately 50 NTUs or less) indicates that only manganese (two samples) and thallium (one sample) exceeded SSSLs and their respective background concentrations. The manganese results were within the range of background values determined by SAIC (1998) (Appendix G). The thallium concentration (0.0069 milligrams per liter [mg/L]) exceeded the range of background values (0.0001 to 0.0053 mg/L); however, the analytical result was flagged with a “B” data qualifier, indicating that thallium was also detected in an associated laboratory or field blank sample. Thallium was not detected in any of the other groundwater samples collected at the site.

Volatile Organic Compounds. Eight of the twelve groundwater samples collected at Boiler Plant No. 4 were analyzed for VOCs. A total of nine VOCs were detected in the groundwater samples. The 1,1,1-trichloroethane, acetone, ethylbenzene, methylene chloride, and xylene results were flagged with a “B” data qualifier, indicating that these compounds were also detected in an associated laboratory or field blank sample. VOC concentrations in the groundwater samples ranged from 0.0003 to 0.0091 mg/L, and the cumulative concentration was 0.048 mg/L.

With the exception of chloroform in one sample, the VOC concentrations in groundwater were below SSSLs. The chloroform concentration (0.0055 mg/L) exceeded the SSSL (0.00115 mg/L) in the sample collected at SI04-GWS01.

Semivolatile Organic Compounds. Eight of the twelve groundwater samples were analyzed for SVOCs. A total of three SVOCs (acenaphthene, di-n-butyl phthalate, and bis[2-ethylhexyl]phthalate) were detected in the groundwater samples. The bis(2-ethylhexyl)phthalate results and one of the di-n-butyl phthalate results were flagged with a “B” data qualifier, indicating that these compounds were also detected in an associated laboratory or field blank sample. In addition, bis(2-ethylhexyl)phthalate and di-n-butyl phthalate were the only detected SVOCs in six of the samples. Phthalate compounds are common laboratory contaminants.

With the exception of bis(2-ethylhexyl)phthalate in one sample, the SVOC concentrations in groundwater were below SSSLs. The bis(2-ethylhexyl)phthalate concentration (0.04 mg/L) exceeded the SSSL (0.0043 mg/L) in the sample collected at SI04-GW04.

6.0 Summary, Conclusions, and Recommendations

IT completed an SI at Boiler Plant No. 4 at FTMC in Calhoun County, Alabama. The SI was initiated by QST and was conducted to determine whether chemical constituents are present at the site at concentrations that present an unacceptable risk to human health or the environment. The SI at Boiler Plant No. 4 consisted of the sampling and analysis of four surface soil samples, six subsurface soil samples, and seven groundwater samples by QST. IT collected groundwater samples from five existing wells previously sampled by QST.

Chemical analysis of samples collected at Boiler Plant No. 4 indicated that metals, VOCs, and SVOCs were detected in the environmental media sampled. Analytical results were compared to the SSSLs and ESVs for FTMC. The SSSLs and ESVs were developed by IT for human health and ecological risk evaluations as part of the ongoing SIs being performed under the BRAC Environmental Restoration Program at FTMC. Additionally, metal concentrations exceeding SSSLs and ESVs were compared to media-specific background screening values (SAIC, 1998), and PAH compound concentrations exceeding SSSLs and ESVs in surface soils were compared to PAH background values for FTMC (IT, 2000b).

The potential threat to human receptors is expected to be low. Although the site is projected for mixed business reuse, the analytical data were screened against residential human health SSSLs to evaluate the site for unrestricted land reuse. In soils, the metals concentrations that exceeded SSSLs were below their respective background concentrations or within the range of background values and thus do not pose an unacceptable risk to human health. The concentration of the PAH compound benzo(a)pyrene exceeded its SSSL in one surface soil sample but was below its PAH background value. VOC concentrations in soils were below SSSLs.

In groundwater, several metals were detected at concentrations exceeding SSSLs and background concentrations. However, the samples with the elevated metals results had high turbidity at the time of sample collection, which is believed to have caused the elevated concentrations. Evaluation of lower-turbidity groundwater samples indicates that metals have not adversely impacted groundwater at the site. The concentration of chloroform (0.0055 mg/L) marginally exceeded its SSSL (0.00115 mg/L) in one groundwater sample. However, the chloroform concentration was below EPA drinking water standards and health advisory values (EPA, 2000) and is not expected to pose a threat to human health.

The potential threat to ecological receptors is also expected to be low. With the exception of copper in two surface soil samples, the metals concentrations that exceeded ESVs were below their respective background concentrations or within the range of background values. Three PAH compounds were detected in surface soils at concentrations exceeding ESVs but below PAH background values. VOC concentrations in site media were below ESVs.

Based on the results of the SI, past operations at Boiler Plant No. 4 do not appear to have adversely impacted the environment. The metals and chemical compounds detected in site media do not pose an unacceptable risk to human health or the environment. Furthermore, the two 50,000-gallon USTs associated with the boiler plant have been removed from the site in accordance with State of Alabama regulations. Therefore, IT recommends “No Further Action” and unrestricted land reuse at Boiler Plant No. 4, Building 1876, Parcels 101(7) and 236(7).

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ATTACHMENT 1

LIST OF ABBREVIATIONS AND ACRONYMS

List of Abbreviations and Acronyms

2,4-D	2,4-dichlorophenoxyacetic acid
2,4,5-T	2,4,5-trichlorophenoxyacetic acid
2,4,5-TP	silvex
3D	3D International Environmental Group
Abs	skin absorption
AC	hydrogen cyanide
AcB2	Anniston and Allen gravelly loams, 2 to 6 percent slopes, eroded
AcC2	Anniston and Allen gravelly loams, 6 to 10 percent slopes, eroded
AcD2	Anniston and Allen gravelly loams, 10 to 15 percent slopes, eroded
AcE2	Anniston and Allen gravelly loams, 15 to 25 percent slopes, eroded
ACGIH	American Conference of Governmental Industrial Hygienists
ADEM	Alabama Department of Environmental Management
AEL	airborne exposure limit
AHA	ammunition holding area
AL	Alabama
amb.	amber
ANAD	Anniston Army Depot
APT	armor-piercing tracer
ARAR	applicable or relevant and appropriate requirement
ASP	ammunition supply point
ASR	Archives Search Report
AST	aboveground storage tank
ASTM	American Society for Testing and Materials
AWWSB	Anniston Water Works and Sewer Board
‘B’	Analyte detected in laboratory or field blank at concentration greater than the reporting limit (and greater than zero)
BCT	BRAC Cleanup Team
BEHP	bis(2-ethylhexyl)phthalate
BFB	bromofluorobenzene
BG	Bacillus globigii
bgs	below ground surface
BHC	betahexachlorocyclohexane
bkg	background
bls	below land surface
BOD	biological oxygen demand
BRAC	Base Realignment and Closure
Braun	Braun Intertec Corporation
BTAG	Biological Technical Assistance Group
BTEX	benzene, toluene, ethyl benzene, and xylenes
BTOC	below top of casing
BW	biological warfare
BZ	breathing zone; 3-quinuclidinyl benzilate
C	ceiling limit value
Ca	carcinogen
CCAL	continuing calibration
CCB	continuing calibration blank
CD	compact disc
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act

CERFA	Community Environmental Response Facilitation Act
CESAS	Corps of Engineers South Atlantic Savannah
CG	carbonyl chloride (phosgene)
CFC	chlorofluorocarbon
ch	inorganic clays of high plasticity
CHPPM	U.S. Army Center for Health Promotion and Preventive Medicine
CK	cyanogen chloride
cl	inorganic clays of low to medium plasticity
Cl.	chlorinated
CLP	Contract Laboratory Program
CN	chloroacetophenone
CNB	chloroacetophenone, benzene, and carbon tetrachloride
CNS	chloroacetophenone, chloropicrin, and chloroform
Co-60	cobalt-60
COC	chain of custody; contaminant of concern
COE	Corps of Engineers
Con	skin or eye contact
COPC	contaminant of potential concern
COPEC	contaminant of potential environmental concern
CRL	certified reporting limit
CRZ	contamination reduction zone
Cs-137	cesium-137
CS	ortho-chlorobenzylidene-malononitrile
CSEM	conceptual site exposure model
ctr.	container
CWA	chemical warfare agent
CWM	chemical warfare material; clear, wide mouth
CX	dichloroformoxime
D	duplicate; dilution
DANC	decontamination agent, non-corrosive
°C	degrees Celsius
°F	degrees Fahrenheit
DCE	dichloroethene
DDD	dichlorodiphenyldichloroethane
DDE	dichlorodiphenyldichloroethene
DDT	dichlorodiphenyltrichloroethane
DEH	Directorate of Engineering and Housing
DEP	depositional soil
DI	deionized
DIMP	di-isopropylmethylphosphonate
DMMP	dimethylmethylphosphonate
DOD	U.S. Department of Defense
DOT	Department of Transportation
DP	direct-push
DPDO	Defense Property Disposal Office
DPT	direct-push technology
DQO	data quality objective
DRMO	Defense Reutilization and Marketing Office

DRO	diesel range organics
DS	deep (subsurface) soil
DS2	Decontamination Solution Number 2
DWEL	drinking water equivalent level
E&E	Ecology and Environment, Inc.
EBS	environmental baseline survey
EE/CA	engineering evaluation and cost analysis
Elev.	elevation
EM	electromagnetic
EM31	Geonics Limited EM31 Terrain Conductivity Meter
EM61	Geonics Limited EM61 High-Resolution Metal Detector
EOD	explosive ordnance disposal
EODT	explosive ordnance disposal team
EPA	U.S. Environmental Protection Agency
EPC	exposure point concentration
EPIC	Environmental Photographic Interpretation Center
ER	equipment rinsate
ESE	Environmental Science and Engineering, Inc.
ESV	ecological screening value
Exp.	explosives
E-W	east to west
EZ	exclusion zone
FAR	Federal Acquisition Regulations
FB	field blank
FD	field duplicate
FedEx	Federal Express, Inc.
FFE	field flame expedient
Fil	filtered
Flt	filtered
FMP 1300	Former Motor Pool 1300
Foster Wheeler	Foster Wheeler Environmental Corporation
Frtn	fraction
FS	field split; feasibility study
ft	feet
ft/ft	feet per foot
FTA	Fire Training Area
FTMC	Fort McClellan
g	gram
G-856	Geometrics, Inc. G-856 magnetometer
G-858G	Geometrics, Inc. G-858G magnetic gradiometer
gal	gallon
gal/min	gallons per minute
GB	sarin
gc	clay gravels; gravel-sand-clay mixtures
GC	gas chromatograph
GC/MS	gas chromatograph/mass spectrometer
GFAA	graphite furnace atomic absorption
GIS	Graphical Information System

List of Abbreviations and Acronyms (Continued)

gm	silty gravels; gravel-sand-silt mixtures	L	lewisite; liter	NIOSH	National Institute for Occupational Safety and Health
gp	poorly graded gravels; gravel-sand mixtures	LC ₅₀	lethal concentration for 50 percent of population tested	No.	number
gpm	gallons per minute	LD ₅₀	lethal dose for 50 percent of population tested	NOAA	National Oceanic and Atmospheric Administration
GPR	ground-penetrating radar	l	liter	NOAEL	no-observed-adverse-effects-level
GPS	global positioning system	LCS	laboratory control sample	NR	not requested; not recorded
GS	ground scar	LEL	lower explosive limit	ns	nanosecond
GSA	General Services Administration	LOAEL	lowest-observed-advserse-effects-level	N-S	north to south
GSBP	Ground Scar Boiler Plant	LT	less than the certified reporting limit	NS	not surveyed
GSSI	Geophysical Survey Systems, Inc.	max	maximum	nT	nanotesla
GST	ground stain	MCL	maximum contaminant level	NTU	nephelometric turbidity unit
GW	groundwater	MDL	method detection limit	O&G	oil and grease
gw	well-graded gravels; gravel-sand mixtures	mg/kg	milligrams per kilogram	OD	outside diameter
HA	hand auger	mg/L	milligrams per liter	OE	ordnance and explosives
HCl	hydrochloric acid	mg/m ³	milligrams per cubic meter	oh	organic clays of medium to high plasticity
HD	distilled mustard	mh	inorganic silts, micaceous or diatomaceous fine, sandy or silt soils	ol	organic silts and organic silty clays of low plasticity
HDPE	high-density polyethylene	MHz	megahertz	OP	organophosphorus
Herb.	herbicides	µg/g	micrograms per gram	ORP	oxidation-reduction potential
HNO ₃	nitric acid	µg/kg	micrograms per kilogram	OSHA	Occupational Safety and Health Administration
hr	hour	µg/L	micrograms per liter	OWS	oil/water separator
H&S	health and safety	µmhos/cm	micromhos per centimeter	oz	ounce
HSA	hollow-stem auger	min	minimum	PAH	polynuclear aromatic hydrocarbon
HTRW	hazardous, toxic, and radioactive waste	MINICAMS	miniature continuous air sampling system	Parsons	Parsons Engineering Science, Inc.
‘I’	out of control, data rejected due to low recovery	ml	inorganic silts and very fine sands	Pb	lead
ICAL	initial calibration	mL	milliliter	PCB	polychlorinated biphenyl
ICB	initial calibration blank	mm	millimeter	PCE	perchloroethene
ICP	inductively-coupled plasma	MM	mounded material	PCP	pentachlorophenol
ICS	interference check sample	MOGAS	motor vehicle gasoline	PDS	Personnel Decontamination Station
ID	inside diameter	MPA	methyl phosphonic acid	PEL	permissible exposure limit
IDL	instrument detection limit	MR	molasses residue	Pest.	pesticide
IDLH	immediately dangerous to life or health	MS	matrix spike	PG	professional geologist
IDM	investigative derived media	mS/cm	millisiemens per centimeter	PID	photoionization detector
IDW	investigation-derived waste	MSD	matrix spike duplicate	PkA	Philo and Stendal soils local alluvium, 0 to 2 percent slopes
IMPA	isopropylmethyl phosphonic acid	MTBE	methyl tertiary butyl ether	POL	petroleum, oils, and lubricants
IMR	Iron Mountain Road	msl	mean sea level	PP	peristaltic pump
in.	inch	MtD3	Montevallo shaly, silty clay loam, 10 to 40 percent slopes , severely eroded	ppb	parts per billion
Ing	ingestion	mV	millivolts	PPE	personal protective equipment
Inh	inhalation	MW	monitoring well	ppm	parts per million
IP	ionization potential	N/A	not applicable; not available	PPMP	Print Plant Motor Pool
IPS	International Pipe Standard	NAD	North American Datum	ppt	parts per thousand
IRDMIS	Installation Restoration Data Management Information System	NAD83	North American Datum of 1983	PRG	preliminary remediation goals
ISCP	Installation Spill Contingency Plan	NAVD88	North American Vertical Datum of 1988	PSSC	potential site-specific chemical
IT	IT Corporation	NCP	National Contingency Plan	pt	peat or other highly organic silts
ITEMS	IT Environmental Management System™	ND	not detected	PVC	polyvinyl chloride
‘J’	estimated concentration	NE	no evidence; northeast	QA	quality assurance
JeB2	Jefferson gravelly fine sandy loam, 2 to 6 percent slopes, eroded	NFA	No Further Action	QA/QC	quality assurance/quality control
JeC2	Jefferson gravelly fine sandy loam, 6 to 10 percent slopes, eroded	ng/L	nanograms per liter	QAP	installation-wide quality assurance plan
JfB	Jefferson stony fine sandy loam, 0 to 10 percent slopes have strong slopes	NGVD	National Geodetic Vertical Datum	QC	quality control
K	conductivity	NIC	notice of intended change	QST	QST Environmental Inc.

List of Abbreviations and Acronyms (Continued)

qty	quantity
Qual	qualifier
‘R’	rejected; resample
RAO	removal action objective
RBC	EPA Region III Risk Based Concentration
RCRA	Resource Conservation and Recovery Act
RDX	cyclonite
ReB3	Rarden silty clay loams
REG	field sample
REL	recommended exposure limit
RFA	request for analysis
RI	remedial investigation
RL	reporting limit
RPD	relative percent difference
RRF	relative response factor
RSD	relative standard deviation
RTK	real-time kinematic
SAD	South Atlantic Division
SAE	Society of Automotive Engineers
SAIC	Science Applications International Corporation
SAP	installation-wide sampling and analysis plan
sc	clayey sands; sand-clay mixtures
Sch.	schedule
SD	sediment
SDG	sample delivery group
SDZ	safe distance zone; surface danger zone
SEMS	Southern Environmental Management & Specialties, Inc.
SFSP	site-specific field sampling plan
SGF	standard grade fuels
SHP	installation-wide safety and health plan
SI	site investigation
SL	standing liquid
sm	silty sands; sand-silt mixtures
SM	Serratia marcescens
SOP	standard operating procedure
sp	poorly graded sands; gravelly sands
SP	sump pump
Sr-90	strontium-90
Ss	stony rough land, sandstone series
SS	surface soil
SSC	site-specific chemical
SSHO	site safety and health officer
SSHP	site-specific safety and health plan
SSSL	site-specific screening level
STB	supertropical bleach
STEL	short-term exposure limit
STOLS	Surface Towed Ordnance Locator System®
Std. units	standard units

SU	standard unit
SVOC	semivolatile organic compound
SW	surface water
SW-846	U.S. EPA <i>Test Methods for Evaluating Solid Waste: Physical/Chemical Methods</i>
SZ	support zone
TAL	target analyte list
TAT	turn around time
TB	trip blank
TCA	trichloroethane
TCDD	2,3,7,8-tetrachlorodibenzo-p-dioxin
TCDF	tetrachlorodibenzofurans
TCE	trichloroethene
TCL	target compound list
TCLP	toxicity characteristic leaching procedure
TDGCL	thiodiglycol
TDGCLA	thiodiglycol chloroacetic acid
TERC	Total Environmental Restoration Contract
TIC	tentatively identified compound
TLV	threshold limit value
TN	Tennessee
TOC	top of casing; total organic carbon
TPH	total petroleum hydrocarbons
TRADOC	U.S. Army Training and Doctrine Command
TRPH	total recoverable petroleum hydrocarbons
TWA	time weighted average
UCL	upper confidence limit
UCR	upper certified range
‘U’	not detected above reporting limit
USACE	U.S. Army Corps of Engineers
USACHPPM	U.S. Army Center for Health Promotion and Preventive Medicine
USAEC	U.S. Army Environmental Center
USAEHA	U.S. Army Environmental Hygiene Agency
USACMLS	U.S. Army Chemical School
USAMPS	U.S. Army Military Police School
USATEU	U.S. Army Technical Escort Unit
USATHAMA	U.S. Army Toxic and Hazardous Material Agency
USCS	Unified Soil Classification System
USDA	U.S. Department of Agriculture
USEPA	U.S. Environmental Protection Agency
UST	underground storage tank
UXO	unexploded ordnance
VOA	volatile organic analyte
VOC	volatile organic compound
VOH	volatile organic hydrocarbon
VQlfr	validation qualifier
VQual	validation qualifier
VX	nerve agent (O-ethyl-S-[diisopropylaminoethyl]-methylphosphonothiolate)
Weston	Roy F. Weston, Inc.

WP	installation-wide work plan
WS	watershed
WSA	Watershed Screening Assessment
WWI	World War I
WWII	World War II
XRF	x-ray fluorescence
yd ³	cubic yards

SAIC – Data Qualifiers, Codes and Footnotes, 1995 Remedial Investigation

N/A – Not analyzed

ND – Not detected

Boolean Codes

LT – Less than the certified reporting limit

Flagging Codes

9 – Non-demonstrated/validated method performed for USAEC

B – Analyte found in the method blank or QC blank

C – Analysis was confirmed

D – Duplicate analysis

I – Interfaces in sample make quantitation and/or identification to be suspicious

J – Value is estimated

K – Reported results are affected by interfaces or high background

N – Tentatively identified compound (match greater than 70%)

Q – Sample interference obscured peak of interest

R – Non-target compound analyzed for but not detected (GC/MS methods)

S – Non-target compound analyzed for and detected (GC/MS methods)

T – Non-target compound analyzed for but not detected (non GC/MS methods)

U – Analysis in unconfirmed

Z – Non-target compound analyzed for and detected (non-GC/MS methods)

Qualifiers

J – The low-spike recovery is low

N – The high-spike recovery is low

R – Data is rejected